Comments for Region 9 from Joe Beaman, Senior Toxicologist, OW/OST/HECD:

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Thank you for the opportunity to comment on this important and comprehensive technical report. This is a review of the science and technical merits of the methodology and its supporting documents. This technical review **does not** represent the Agency view on this methodology or the supporting materials. The level of this review is that of a staff-level senior toxicologist and is restricted to the derivation methodology.

General Comments/Overview:

The goal of this project was to develop a methodology for derivation of pesticide water quality criteria for the protection of aquatic life in the Sacramento River and San Joaquin River basins. The new methodology was deemed necessary because the Phase 1 Review of existing world-wide methodologies did not reveal an individual existing methodology that could be used to derive protective criteria (based on Central Valley Water Quality Objectives). Therefore, a new methodology was deemed necessary and was produced by combining features from existing methodologies with refinements based on research in aquatic ecotoxicology. The current document proposes a framework for deriving criteria for a number of pesticides in the Central Valley.

The third chapter presents analyses for approaches to data collection, evaluation, and reduction, and also methods of incorporation of water quality parameters, as well as a discussion of protecting sensitive species, ecosystem integrity, as well as challenges due to chemical mixtures.

The authors' inclusion of comprehensive guidance for data evaluation and filtering is practical, and allows for objectivity and transparency in this important and sometimes controversial step of the criteria derivation process. This guidance may have widespread value in the near future, and the authors should share this guidance with other state and Regional EPA colleagues. Wide acceptance of these guidelines would go a long way in ensuring criteria derivation is based on sound scientific data, regardless of the entity performing the derivation.

The authors also provide a number of flow charts, data summary sheets, web addresses and tables are provided that will help provide guidance for determination of physical chemical parameters, default acute-to-chronic ratio, and other statistical tools and statistically-based tools and support values.

3-2.4 Data Reduction

In Step12. v. d), the authors recommend removing statistical outliers, even if no scientifically acceptable reason for their deletion is present, they further recommend using "procedures" to determine if the potentially over or underproductive criteria as

calculated provide adequate protection. In Section 3-6, they recognize that criteria may need to be adjusted "downward" based on numerous considerations such as ecosystem protection, presence of threatened and endangered species, etc., but provide no objective guidance on how this should be done. What type of value do the authors intend? A safety factor? Uncertainty factor? What will be its magnitude? What will it be based on?

3.-3.1 Species Sensitivity Distributions

1. Since the Central Valley Waterboard is developing a new methodology and exploring better ways to derive pesticide criteria, would it be more appropriate to derive the criteria based on which distribution fits the data best on a case-by-case basis, rather than relying on a single (albeit flexible) distribution?

3-3.1.1 Data Requirements

The 1985 Guidelines (USEPA1985), require 8 specific taxa be present at a minimum to derive criteria, so as to ensure adequate protection for aquatic life. The proposed methodology removes requirements for the third chordate taxa (fish or amphibian), a non-chordate family such as mollusks and rotifers, and additional taxa not already represented in the dataset, while adding in a specific requirement fro an alga/aquatic vascular plant when deriving criteria for herbicides. This approach is potentially problematic in that:

a) By inclusion of a plant in the data set, one might underestimate the toxicity of an herbicide if the remainder of the dataset were relatively insensitive. The 1985 Guidelines require a separate assessment for plant sensitivity by comparison of the Final Plant Value with the derived criteria, rather than implicit inclusion in the data set.

b) Removal of the third chordate may be potentially problematic, especially if amphibians are innately sensitive to the pesticide for which criteria derivation is being performed. A re-assessment of the proposed atrazine criteria is in progress due to concerns of amphibian toxicity. It is evident that at least frogs are resident to San Joaquin Valley (Moyle, 1973). If amphibians (or other required taxa – based on the 1985 Guidelines) are not present, the Central Valley Waterboard should provide taxa lists fro the watersheds in question to demonstrate that potentially sensitive species are not present.

c) Removal of the additional non-chordate requirement may also reduce protectiveness of criteria. In the case of ammonia, recent work has demonstrated that listed species of unionid mussels are particularly sensitive to the effects of ammonia. (Augsberger et.al. 2003). Also, as referenced in your methodology, chronic criteria for the pesticide, tributyltin, was based on endocrine effects on marine snails (USEPA, 2003).

3-3.2 Assessment Factor

While the assessment factor derived by the new method makes more sense because it is pesticide specific and does not contain data from other chemical classes, there are several concerns with the new assessment factor methodology.

1) The pesticides selected for this analysis do not reflect the full set of pesticides for which there is at least some data for. Also, while this procedure uses the method of Host et al, which is the basis for the USEPA Great Lakes Initiative Tier II Assessment Factors, both methods are limiting in that they are not inclusive of smaller data sets. The authors are encouraged to look for potential calculation methodologies that may incorporate smaller data sets. This will ensure a sound scientific basis for the use of this type of factor in that it is not biased by a data richness requirement.

2) The additional factor of 10 on top of a factor of 57 (essentially dividing the single taxon acute value by 570), may prove to be problematic in that its application is subjective and not based on objective decision rules or criteria. While the goal is ecosystem protection, there needs to be a balance between criteria so that criteria do not go well beyond there intended use and become an onerous burden on the regulated community. Experience with the GLI Tier II criteria values has demonstrated that these types of values are not widely accepted, since the methodology has been in existence for 10 years, and has seen only limited regulatory use.

3-4.2.3 Default Acute to Chronic Ratios

The authors propose a default ACR of 12.4 based on the 80^{th} percentile of a distribution of 8 available pesticide ACRs. Three pesticides (chlordane, dieldrin, and lindane) have been banned for all uses in the United States by USEPA). Since these are not current use pesticides, chronic criteria derivation based on a default ACR including these pesticides is problematic in that it does not represent a current understanding of pesticide mode of action and toxicity, which are somewhat reflected through the acute to chronic ratios calculation. To reflect current science, the authors should consider removing chlordane, dieldrin and lindane and recalculating the default Acute to chronic ratio. The authors could also choose to use a more conservative percentile (e.g. 90^{th} or 95^{th} percentile) to ensure protectiveness of the criteria

Temperature Effects on Chlorpyrifos Toxicity

Chlorpyrifos toxicity increases at higher temperatures (Chapter 4, pp 4-8). Also, Buchwalter et al., 2003 demonstrated that accumulation of waterborne chlorpyrifos by aquatic animals increases with exposure temperature. This is particularly evident for acute exposures. Elevated metabolic rates (particularly for fish) occur at warmer temperatures increase accumulation minutes to hours after initiation of a waterborne

exposure. The report cites work that demonstrates rather remarkable increases in chlorpyrifos toxicity at higher temperatures (15-fold decrease in LC50 for rainbow trout from 7 to 18 degrees Celsius).

Since water is a highly regulated resource in the Central Valley due to agricultural needs and practices, the potential for increased chlorpyrifos toxicity due to elevated temperature in the Sacramento and San Joaquin River systems and elevation is potentially a major issue for salmonids (as stated in the document), particularly if chlorpyrifos presence in streams co-occur with increased temperatures and salmonid presence. There is precedent for adjusting chemical criteria based on water quality parameters such as hardness adjustments for some metals, as well as adjusting temperature criteria to protect valuable aquatic resources such as salmonids. Chlorpyrifos criteria adjusted for temperature is worthy of consideration and should be investigated further.

References

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Moyle, P.B. 1973. Effects of introduced bullfrogs, *Rana catesbeiana*, on the native frogs of San Joaquin Valley, California. Copeia 1973:18-22.

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